WESTERN ELECTRIC
MERRIMACK VALLEY WORKS

The size of our new plant makes it impractical to show you all of its features. We hope that this booklet will bring you some added information and will be an interesting memento of your visit. We are pleased to have had you as our guest.

Harvey Muhlhaus

*Works Manager*

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# Welcome To The Merrimack Valley Works

We hope you enjoyed your visit to the Merrimack Valley Plant of the Western Electric Company.

It gave us real pleasure to show you something of our operations and facilities, and we appreciate your time and effort in visiting us. We hope your interest was rewarded by some of the new things you saw here.

We're sorry it wasn't possible for all of us — the thousands of men and women who operate Western Electric's Merrimack Valley plant — to greet you personally. But if you live in this part of Massachusetts, many of us are undoubtedly your friends and neighbors. You may have seen quite a few familiar faces; and if so, we hope you had time to stop and say hello.

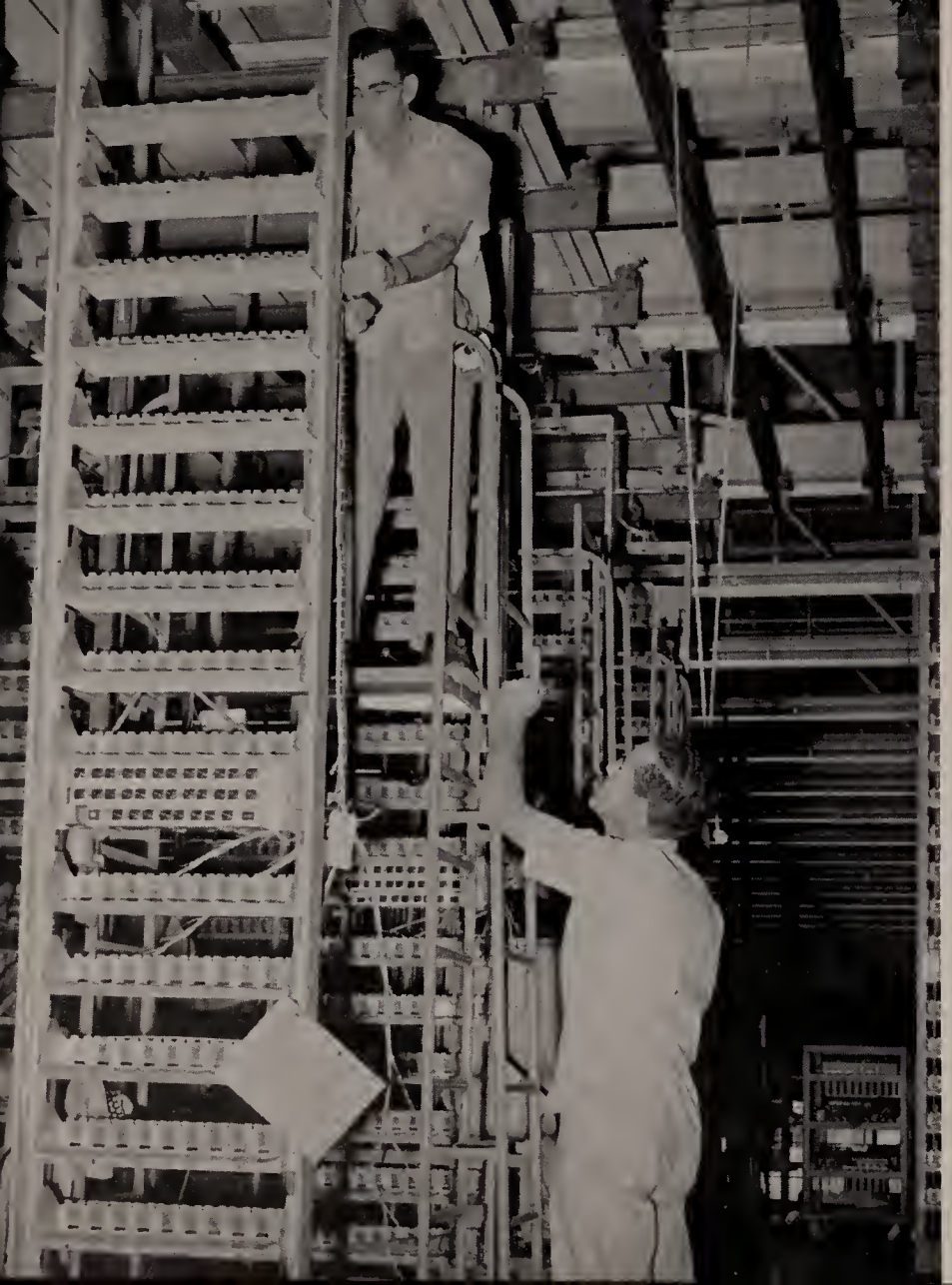
But even if your home is across the continent, we trust you felt as welcome as if you lived across the street. Certainly, we have something in common — the telephones and associated equipment that we make, and that you use so frequently in your everyday business and social life.

As you came up the sidewalks to our front door, you may have wondered what type of products are manufactured here that require so much space and so many people. Altogether the Merrimack Valley plant has 1,400,000 square feet of floor space — quite a walk to see all of it.

Most of the space is used to manufacture electronic equipment that permits several telephone conversations to flow independently over the same pair of wires at the same time, without interference. If this sounds quite complicated, and a bit marvelous, we'll agree that it is. In our business this product is called "carrier equipment," and there is more about it a little farther on in this booklet.

Manufacturing operations began at the new Merrimack Valley Plant in 1956. The big, modern buildings are a new landmark on the historic New England countryside, although we first started operating in the Merrimack Valley area when we opened the Haverhill Shops in 1943.

The Western Electric Company was started as the firm of Gray and Barton in Cleveland in 1869 to manufacture a printing telegraph device. The firm's business spread to other electrical instruments and in 1872 it became the Western Electric Manufacturing Company. Following Professor Bell's invention, it quickly established a reputation for making high quality telephone equipment, and in 1882 became part of the Bell System. Today Western Electric has facilities in more than 50 American cities and towns, including North Andover — a community of which we are particularly proud to be a part.



# What We Do At The Merrimack Valley Works

If a single pair of telephone wires were needed to transmit each long distance telephone conversation, so many circuits would be required that the cost would be almost prohibitive.

At the Merrimack Valley Works, we manufacture transmission equipment for use in multi-channel communications systems. Several television programs may also be carried over facilities which otherwise could transmit only a single program.

We manufacture a wide variety of products from small coils weighing less than one-half ounce to large wired equipment bays eleven and one-half feet high and weighing about half a ton. To manufacture these complex electronic equipments requires the employment of a large number of people responsible for the following functions:

*Manufacturing* . . . make equipment and apparatus of high quality from raw materials and component parts according to the detailed specifications set up by the engineering departments.

*Some wired equipment bays are eleven and one-half feet high and weigh about half a ton.*

*Production Service* . make available components and materials as required, and also responsible for the maintenance of stock and for expediting customers' orders.

*Engineering* . . . . . develop and improve manufacturing methods and provide manufacturing information and facilities.

*Purchasing* . . . . . procure raw materials and component parts from thousands of outside suppliers.

*Accounting* . . . . . pay wages and bills and prepare accounting reports for management.

*Quality Assurance* . audit the quality of our shipped products.

*Merchandise* . . . . . store and ship finished product to the customer and provide associated customer service.

ABOVE: *Tantalum capacitors are an example of the modern trend toward miniaturization.*

BELOW: *Skilled draftsmen help provide manufacturing information.*

# We Make Equipment . . .

The equipment we make looks somewhat like the inside works of a complex radio or television set, except that our equipment is made in many different sizes and designs for many different purposes. Because it's used in telephone exchanges, repeater stations, and commercial establishments, you probably haven't seen it in operation. However, every time a long distance telephone call is made, the products of our Equipment Shops go into operation.

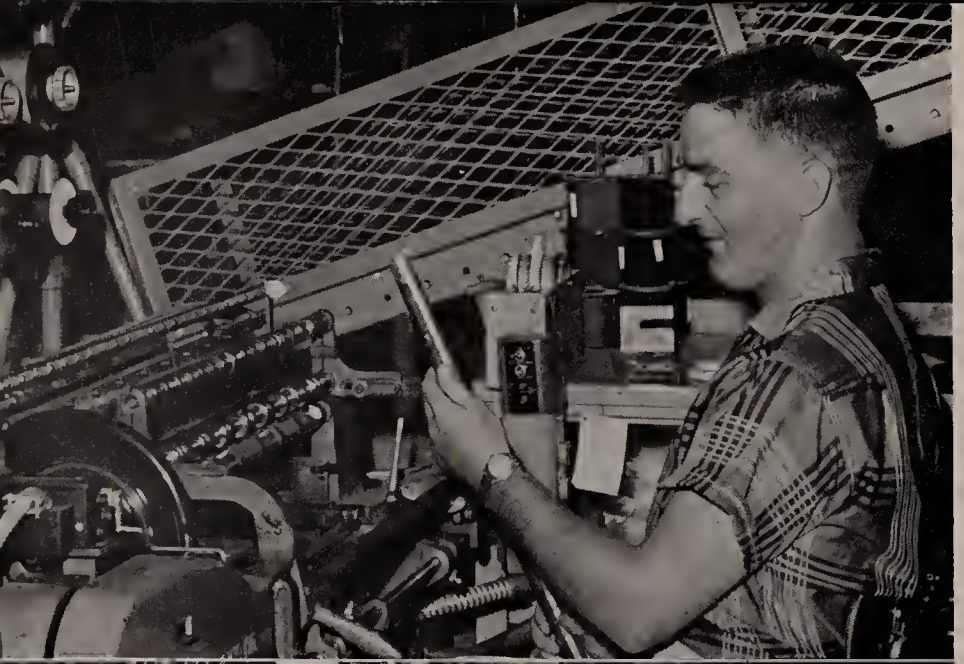
These devices carry voice signals which are generated when a person speaks into a telephone or microphone. Or, they carry picture signals when a television camera views a scene. These signals then are transmitted by overhead wires, underground cables or through the air to their destinations. By means of the carrier equipment we manufacture, it is possible to transmit many voice signals or several picture signals simultaneously.

ABOVE: *Portion of the N & O Carrier equipment shop.*
BELOW: *N & O Carrier expander-signaling unit wiring production line.*

For best operation and low cost service, a number of different types of carrier systems have been designed, adaptable to various types of operating conditions. For example, carrier equipment needed for economical service in the rural areas of the country is different in design and complexity from similar equipment needed in metropolitan areas. As the communications art advances, new designs are brought forth replacing existing systems and providing better and less costly service.

Basically then, the Merrimack Valley Works is the manufacturing location for Bell System equipment for multiple transmission of voice and picture signals. Approximately one-half of our people directly involved in manufacture are employed in the assembly, wiring and testing of these equipment products.

*Visual inspection of television program switching equipment.*



# And We Make Apparatus

The operation of all this complicated equipment depends upon the parts that go into it. Engineers call them "components" — resistors, capacitors, electron tubes, relays, coils, transformers, inductors and quartz crystal units. Here at Merrimack Valley we make many of these components which we group together under the name of "apparatus."

Most of the components manufactured at Merrimack Valley immediately go into transmission equipment made here, but nearly every piece of telephone equipment made at any Western Electric Company plant uses one or more items manufactured here at Merrimack Valley.

On the first floor of the plant you probably saw manufacturing facilities to make the first parts from raw materials like brass, steel and plastics. These parts are then used in the assembly of our apparatus and equipment.

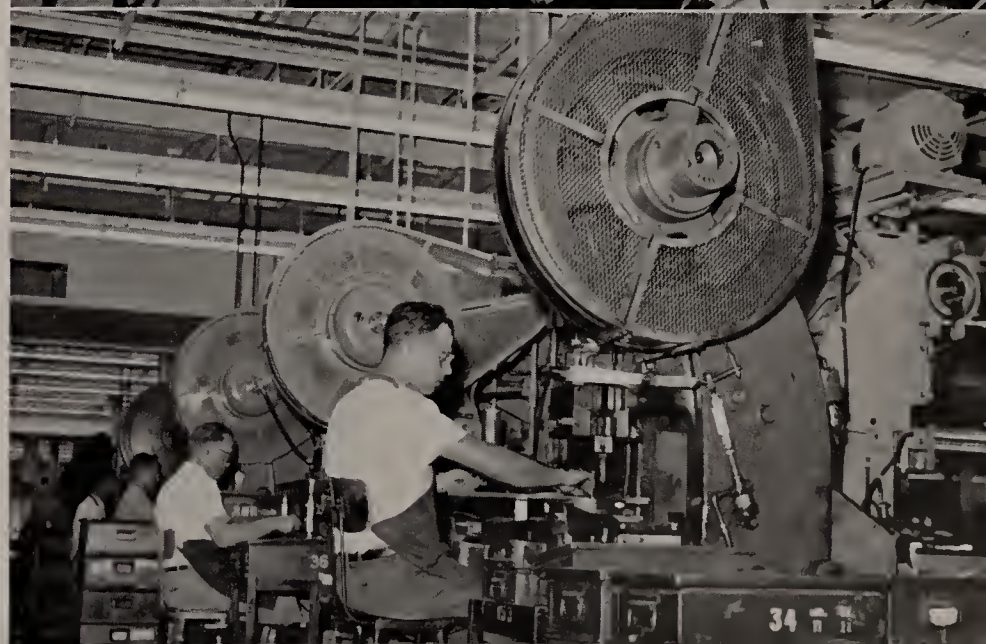
ABOVE: *Winding of several coils in a stick form on a multiple winding machine.*

BELOW: *Battery of machines winding doughnut-shaped toroidal coils.*

The Parts Shop is capable of shearing, forming, punching, turning, drilling, heat treating and plating a wide variety of raw materials needed to provide the thousands of parts for subsequent operations.

To manufacture apparatus requires great quantities of raw materials. During a single year, for example, we use two and one-half million pounds of wire, hundreds of tons of steel and large quantities of copper, brass, quartz and similar materials.

Approximately one-half of our people directly involved in manufacture are employed in that part of our business which we call the "Apparatus Shops."



ABOVE: *Preparing the ends of toroidal coil wires.*
BELOW: *A complete machine shop produces finished piece parts ready for final assembly of apparatus and equipment.*

# Conveyorized Storerooms

A portion of the second floor of the factory building is devoted to the storage of parts and components. Basically, this storage area is divided into two sections; one serving the apparatus shops on the south half of the floor, and the other serving the equipment shops on the north half. The ceiling height permits the use of a two level storage area to make more economical use of the floor space.

The apparatus storeroom and manufacturing area are served by conveyors which deliver parts and partially completed products to the various operations of the apparatus shop. The heart of the conveyor design is a dispatching system not unlike that found in large railroad terminals. The material is automatically routed to its destination and the efficient scheduling of the work load and control of the amount of material on hand is maintained.

ABOVE: *Through the use of modern conveyors, work scheduling is simplified and handling of materials is reduced.*

BELOW: *Conveyorized Dispatching system controls the flow of material from storeroom to the apparatus shop.*

The equipment storeroom is served by a drag line truck conveyor, also with a dispatching system for selecting material from designated zones. Trucks are removed from the conveyor at a pre-determined place, pushed through the area as material is loaded, and placed back on the conveyor for transport to subsequent areas and finally to the destination. Gravity conveyors are used to send material to manufacturing groups next to the storeroom. Material for other groups is delivered by power trucks.

*Drag-line truck conveyor used in selecting components from equipment storeroom.*

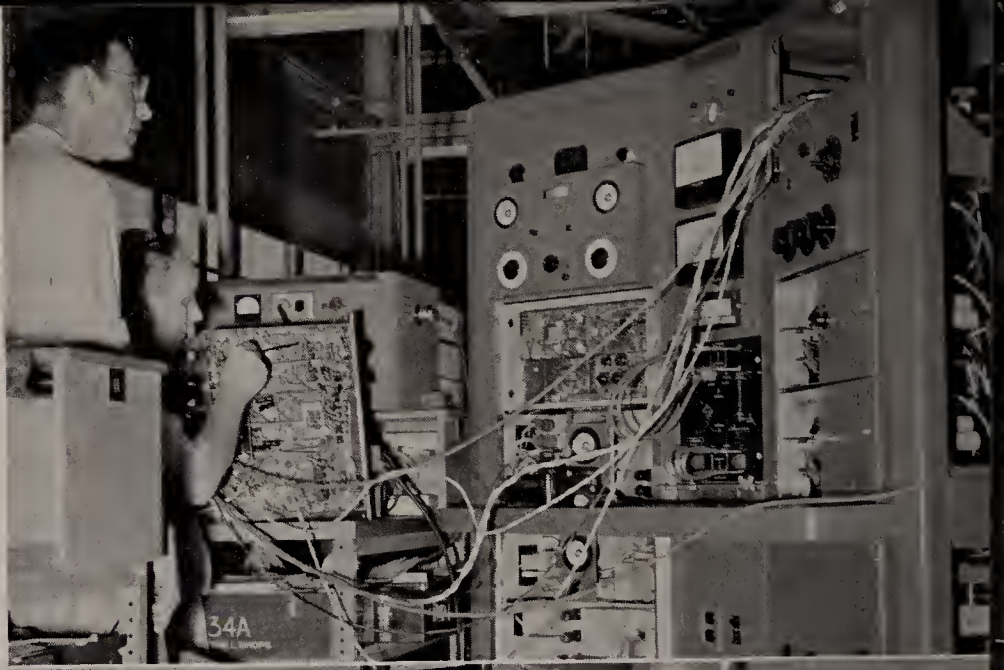
# Tools — Large And Small

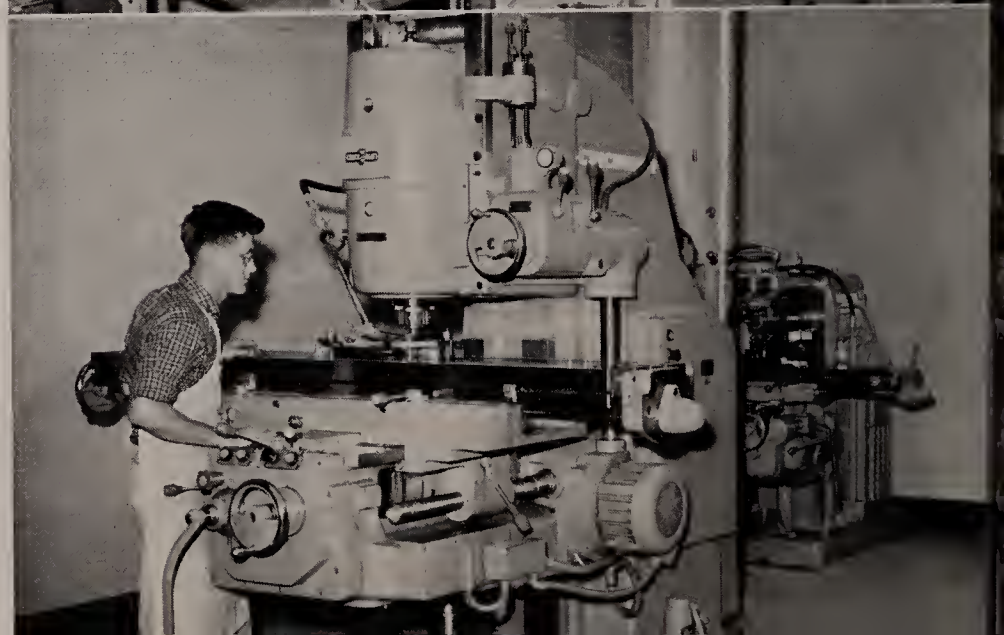
A manufacturing business such as ours requires many tools, not only of the screwdriver and pliers variety familiar to all of us, but also complex tools specially designed and skillfully constructed for efficient high-volume manufacture of many of our parts.

In our plant are skilled tradesmen provided with the most modern machines available. They build new production equipment and insure that our production lines will have an uninterrupted flow.

Among the many machines and tools these experts maintain are high speed punch presses designed for large volume manufacture of parts. The tools used in these machines, complex punches and dies made by skilled toolmakers working with the hardest tool steels known to man, are ground to tolerances as close as (±.0005), half a thousandth of an inch, or 1/6 the thickness of a human hair.

Maintenance of these tools and other plant facilities is in the hands of specialists. They include electricians, test set technicians, pipefitters, carpenters, metal workers, millwrights, painters, heating and ventilating specialists and other craftsmen who play a vital role in our manufacturing operations. These men, using all of their technical knowledge and skills, keep the plant rolling.



ABOVE: *Among the tools we design and build are highly complex test sets.*

BELOW: *Skilled tradesmen are provided with the most modern machines available.*

# Quality Is The Watchword

So complex is the telephone system that spans America, and so extreme are the conditions of weather and location to which telephone equipment is subjected, that fine workmanship and high quality are absolutely necessary to assure continued operation of that equipment with a minimum of maintenance. Guardians of our product quality are two organizations which share this responsibility.

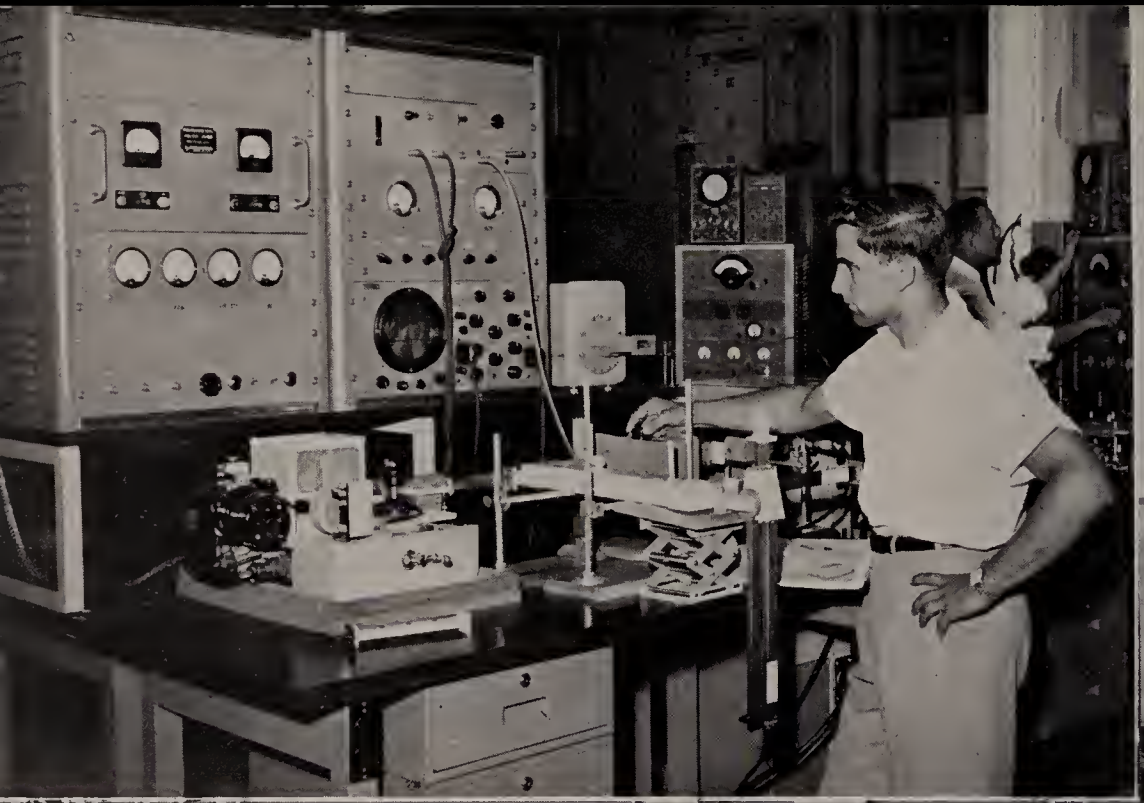
The Inspection Organization checks our products, during manufacture, against the rigid engineering specifications. It is quite apparent that complex radio-like equipment such as we manufacture will require exhaustive testing procedures of a highly technical nature. That this is true, for example, is borne out by the fact that a single unit of equipment may require as much as forty hours, a full work week, to be thoroughly tested.

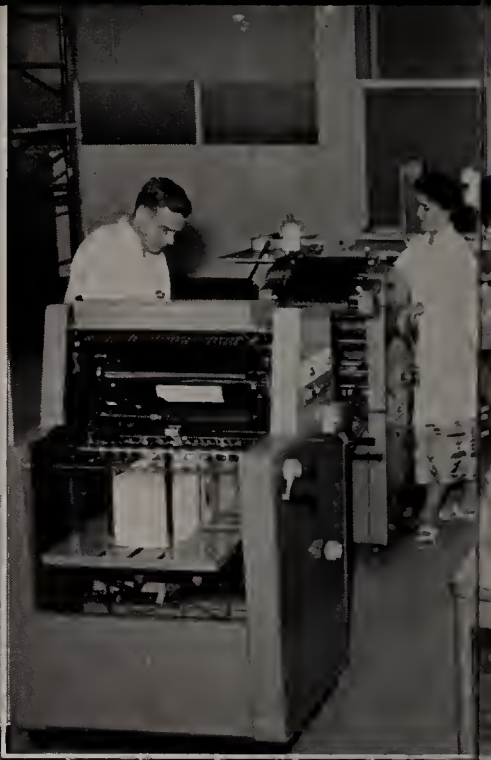
The Quality Assurance Organization scientifically inspects our completed product and issues reports to all levels of Western Electric Management and, through the Bell Telephone Laboratories, to the associated telephone companies, keeping them informed as to the quality of the product.

At Western Electric, quality is the watchword.

ABOVE: *Testing "N" Carrier repeater unit on semi-automatic test set.*

BELOW: *Inspecting "O" Carrier frame unit to rigid Bell System mechanical requirements.*





*Our business requires the employment of a large number of people responsible for many different functions.*

# "THE PLANT"

## facts & figures

## equivalent households

| | | |
|---|---|---|
| ELECTRIC | 3,300,000 KW HRS/MONTH | 25,000 |
| GAS | 350,000 CU FT/MONTH | 150 |
| WATER | 1,000,000 CU FT/MONTH | 800 |
| TELEPHONES | Tel. 2,100 Ext. 1,400 $ 400,000/ANNUAL | 2,100 |
| FUEL OIL | 1,300,000 GAL/ANNUAL | 800 |
| FLOOR SPACE | 1,400,000 SQUARE FEET | = 30 FOOTBALL FIELDS |

**parking lot = 20 ACRES - 3000 CARS**

# Housekeeping And Protection

You may have wondered how a plant of this size is kept clean. Thousands of square feet of floor space are swept every twenty-four hours in order to keep these acres of floor space clean. In addition, these areas are washed and waxed at regular intervals. Maintaining the many washrooms in a clean and healthful condition requires considerable time and effort. Snow removal on so many miles of roadway and acres of parking space is a big problem in itself. Also, such outside maintenance work as taking care of shrubs, trees and acres of lawn is important in making the plant a good place to work.

Our Plant Protection force aids uninterrupted production by checking movements in and out of the plant and is continually alert for emergency situations. These people, our guards, plant inspectors, and others, are charged with the responsibility of safeguarding our property to assure conformance with safety regulations of Federal, State and Municipal governments as well as those established by the company.

ABOVE: *The Plant Protection Force is continually alert.*
BELOW: *Special equipment is used to keep the plant clean.*

# Serving The Plant's People

During your visit, we hope you looked in on some of our activities not part of the manufacturing and business operations.

Perhaps you paid a visit to the plant hospital in the administration building. The hospital, our First Aid center, has a completely equipped operating room for emergencies; full X-ray, examination and consultation facilities.

All Western Electric people receive a complete physical examination at the time of their employment. New employees are told about the company's retirement program, insurance and other benefits. Safety glasses and other safety equipment are provided for those of us who require it by the nature of our work. We're all kept conscious of the Bell System safety motto, which you may have seen posted at various places throughout the plant:

> "No job is so important and no service is so urgent that we cannot take time to perform our work safely."

We hope you enjoyed your visit to one of our cafeterias, scientifically designed for the most convenient serving of food in cheery surroundings.

ABOVE: *Employment interviewers are friendly and skilled.*

BELOW: *Reception area of our modern medical facilities.*

# Our Guideposts

Western Electric Company employees are part of a team upholding a tradition of fine workmanship and service to the Bell System and to telephone users throughout the country. This heritage is based upon a philosophy established many, many years ago and proved by the test of time. It is the policy of the company:

1. To pay all employees adequately for services rendered.
2. To maintain reasonable hours of work and safe working conditions.
3. To provide continuous employment consistent with business conditions.
4. To place employees in the kind of work best suited to their abilities.
5. To help each individual to progress in the Company's service.
6. To aid employees in times of need.
7. To encourage thrift.
8. To cooperate in social, athletic and other recreational activities.
9. To accord to each employee the right to discuss freely with executives any matters concerning his or her welfare or the Company's interest.
10. To carry on the daily work in a spirit of friendliness.

ABOVE: *Safety shoes are available for employees.*
BELOW: *Attractive, modern cafeterias are enjoyed by our employees.*

# Employee Activities

Employee activities are centered around the Merrimack Valley Club, of which every employee is automatically a member. The Club has a continuing program and every employee has a voice in the planning of activities through one or more representatives. Policies of the Club are carried out by officers and directors selected by the employees. Participation in any of the club activities is on a voluntary basis.

In the field of recreation, the Club sponsors bowling, softball, and golf leagues during the appropriate seasons. Bowling, which is one of the most active sports programs, has approximately 1,200 participants annually. The softball leagues include 44 competing teams which meet after work for their weekly competitions. Golf, too, is a busy activity and competitive matches are played several nights each week during the spring, summer, and early fall.

*Softball and bowling are popular Merrimack Valley Club sports.*

The highlight of the Club's social season is the annual "Hello Charley" Dance, at which time employees select and crown a Vacation Queen. The Club also holds an annual family outing at a local amusement park. Employees, their families and friends attend for a day of fun and frolic.

Special events, such as theatre parties, bridge parties, ski excursions and similar activities are sponsored at various times throughout the year.

In its educational endeavors, the Club sponsors an evening school. The courses offered, at nominal cost, cover a broad variety of subjects ranging from advanced electronics to practical arithmetic, through photography and knitting. In the two semesters, fall and spring, approximately 1,200 people enroll for courses.

ABOVE: *Our Vacation Queen is elected by the employees and ceremoniously crowned at the annual "Hello Charley" Dance.*

BELOW: *Voluntary out of hours classes are enjoyed. Here employees attend a Charm Course.*

# The Bell System

The parent organization in the Bell System family is the American Telephone and Telegraph Company which provides engineering, commercial, financial and other related services for its associated telephone companies. The American Telephone and Telegraph Company also operates the long distance telephone lines.

Working together to give the best possible telephone service at the lowest possible cost consistent with good business practices are the Operating Telephone Companies, the Bell Telephone Laboratories and the Western Electric Company.

The Operating Telephone Companies, such as the New England Telephone and Telegraph Company, are responsible for providing telephone and other communication services within their respective territories.

The Bell Telephone Laboratories perform the research and fundamental product development for the entire Bell System. A branch of the Laboratories is located at the Merrimack Valley Works for development of most of the apparatus and equipment manufactured here.

The Western Electric Company is the manufacturing and supply unit for the Bell System.

ABOVE: *Modern manufacturing facilities create pleasing working conditions.*

BELOW: *Telephone Laboratories' basic research and development advance the art of communications.*

# Western Electric's Place In The Bell System

By providing dependable service to the public and the Bell System, and through its progress in manufacturing techniques and merchandising, the Western Electric Company has attained its position as the manufacturing and supply unit of the Bell System. In fulfilling this role, the company has four major functions:

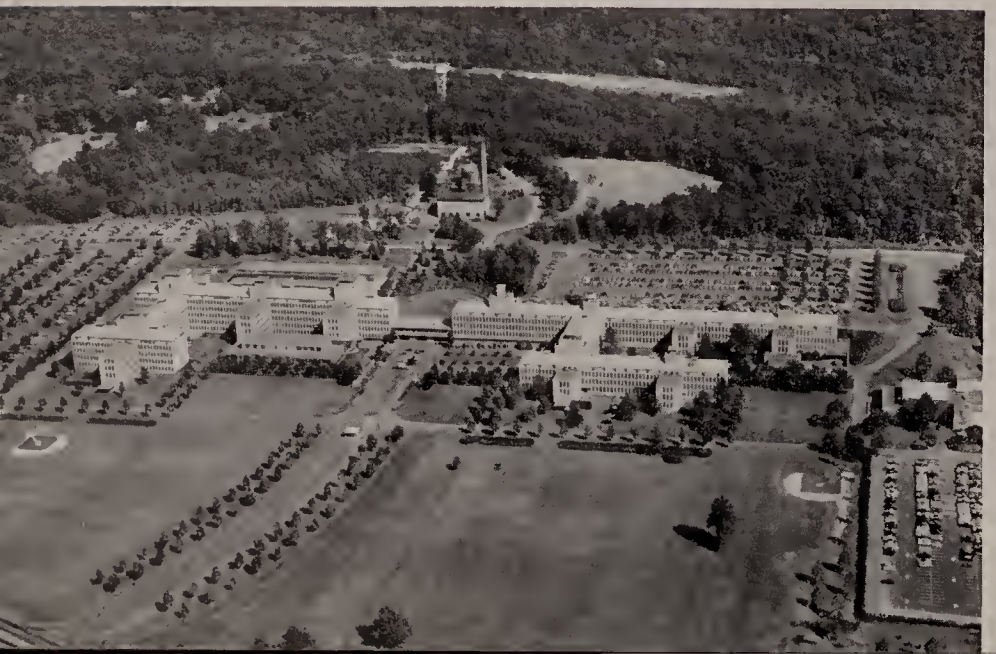
1. The Manufacturing Divisions, of which the Merrimack Valley Works is a part, produces all types of communication equipment needed by the Bell System.
2. Installation installs the complex communications equipment in most of the Bell System's Central Offices, and branch exchanges of subscribers.
3. Purchasing buys the materials for manufacturing operations and also buys most of the supplies, from paper clips to telephone poles, needed by the operating Telephone Companies for their many different jobs.
4. The Distribution Division channels to the telephone companies, through its strategically located distributing centers, products of the manufacturing units and supplies procured by the Purchasing Organization. These centers are an immediate source of supply in the event of any emergency such as hurricane, fire or flood.

ABOVE: *Operating Telephone Companies provide telephone and other communication services.*

BELOW: *The Distribution Division channels products of the manufacturing units and outside suppliers to the telephone companies.*

# Research And Development

The telephone, like all man's great inventions, was fashioned of the stuff of dreams. The man who did the dreaming was Alexander Graham Bell. He took certain of nature's raw materials, imaginatively combined them according to certain of her scientific laws and made a device for strengthening the bonds of fellowship among men through the spoken word.



*Aerial view of Bell Telephone Laboratories at Murray Hill, New Jersey.*

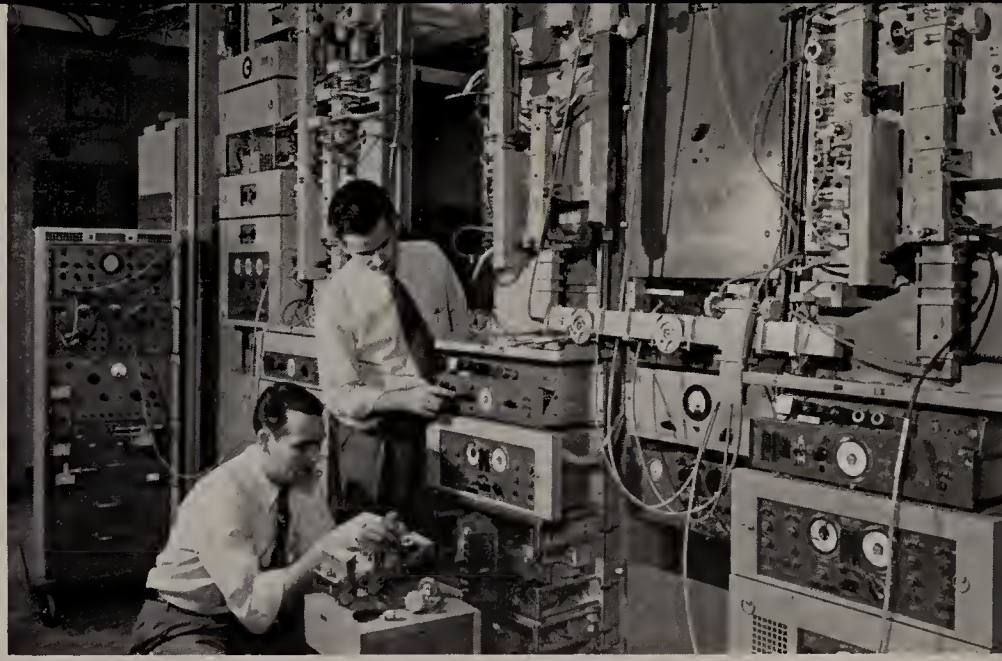
Some 200 of Bell's scientific descendants are associated with us here in the Merrimack Valley plant. They are members of the branch laboratory maintained by Bell Telephone Laboratories, research and development unit of the Bell System.

You saw their working quarters on the first floor, a panorama of exquisitely complex and sensitive instruments, gleaming fixtures and assorted apparatus. These engineers and technicians perform the important function of design for manufacture, and help us to shorten the interval between the time a new product comes off the drawing boards and when it appears on our shipping platform ready for the telephone companies. Largely, this means helping to solve problems of a scientific and engineering nature. There are lots of these problems because telephony is a rapidly advancing art.

The basic research and development work is carried on at the Laboratories headquarters in New Jersey and in recent years one of the important functions

has been related directly to the nation's defense. Today, for example, Laboratories' projects include work in guided missiles, advanced radars, fire control and computer devices. Their major responsibility, however, is the advance of telephone technology. Among the significant landmarks in communications progress is the seven-digit dial system, multi-message carrier over a single circuit, long distance radio-telephony, submarine cable which provides a sure voice link between the continents, transmission of pictures, radio and television programs, microwave radio relay, automatic message accounting and many others.

An example of an important new invention arising from Bell Laboratories research is the transistor. This device, a bit of metal the size of a match head, can do many of the things formerly done by vacuum tubes. Transistors require but a fraction of the space and power consumed by vacuum tubes and thus their development opened a whole new era in telephone technology. The practical application of transistors to telephony, however, poses an impressive number



*Scene in radio laboratory during design stages of TD-2 microwave system.*

of problems in the fields of physics, chemistry, electrical and mechanical engineering, metallurgy and mathematics. The solution of these problems requires the closest possible teamwork between the scientists and engineers who develop new products and those responsible for the manufacture of the finished goods. Hence, it is good business to have a laboratory at Merrimack Valley and we hope you enjoyed seeing it.

# This, Then, Is The Merrimack Valley Works

This, then, is the Merrimack Valley Works, a manufacturing unit of the Western Electric Company, whose people are dedicated to service to the Bell System and whose fine workmanship and high quality of product are major contributions to the efficient operation of the nation's telephone networks.

Our new building in North Andover is among the most modern in the New England area and is designed for the efficient production of equipment and apparatus for the Bell Telephone Companies. The modern design includes facilities for the convenience, comfort and well being of the employee.

We work in a spirit of friendliness and cooperation. It was indeed a pleasure to have you visit our new home.

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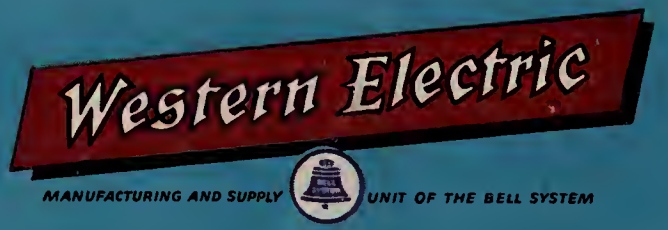
Western Electric
MANUFACTURING AND SUPPLY
UNIT OF THE BELL SYSTEM